AI's Difficulties in Learning Investing

This is evidenced by the patchy performance of AI-driven funds to date

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SINCE its launch in November last year, the astounding sophistication of OpenAI's Chat GPT has plunged the world into another bout of machine learning (ML) and artificial intelligence (AI) frenzy. Companies big and small are rushing to explore how AI can help improve their performance, sparking a boom in the sector that sells the picks and shovels in the AI gold rush.

Indeed, significant breakthroughs have been made in these two domains last two decades. AI systems have accomplished the once unthinkable, like self-driving cars, beating world champions at complex strategy games, and discovering new vaccines and pharmaceutical products.

In the field of investing, anyone who's tried their hands at it would appreciate how difficult it is. Hence the notion of a highly intelligent machine which is constantly learning and adjusting its strategy to capture returns is extremely appealing.

There are a few areas in the investing process that AI and ML can potentially add value to, namely in data extraction, data processing and strategy formulation. Large amounts of data are now readily available. AI can obtain texts, images, sounds and videos from the Internet 24/7. It can scour company annual reports. It can then process all this data to draw conclusions on, say, the level of oil reserves, crop output based on meteorological diagrams and weather forecasts, a company's profitability based on truck movements at its factories or changes in consumers' sentiment on a brand based on social media comments.

Humans have difficulties dealing with the nonlinear relationship between multiple factors and stock prices. ML algorithms such as random forest, ensemble learning and neural network can be used to mine the nonlinear relationships and construct investment strategies. In addition, with the development of reinforcement learning, intelligent quantitative trading can continuously improve the investment strategy.

Given the superiority of machines over humans in the above three areas, it is little wonder that investment practitioners are falling all over themselves to try to utilise AI to extract additional returns. Over the past few years, a number of AI-driven funds and exchange traded funds (ETFs) have been launched.

Have they been able to earn outsized returns?

Not exactly.

Underwhelming performance of AI-powered funds

In their paper *A review of machine learning experiments in equity investment decision-making: why most published research findings do not live up to their promise in real life,* Messrs. Boczynski, Cuzzolin and Sahakian said: "The picture of real-world AI-driven investments is ambiguous and conspicuously lacking in high-profile success cases (while it is not lacking in high-profile failures)."

"Some of the high-profile news stories in the ML-driven investment space have been those of underperformance and/or liquidation," they noted in their paper published in the International Journal of Data Science and Analytics.

Aidyia was a Hong Kong-based ML-driven hedge fund employing ensemble models. It was created and run by AI legend Ben Goertzel. The fund liquidated after less than a year due to disappointing performance. Mr Goertzel is not currently active in the ML-driven investment space.

Sentient Technologies, a high-profile AI start-up which attracted US$143 million in venture capital funding, established Sentient Investment Management and launched a fund which employed its evolutionary algorithms-based trading strategies. The fund liquidated in 2018 after less than two years in operation.

Jim Rogers' Rogers AI Global Macro Exchange Traded Fund (ETF) was launched in June 2018 and closed a year later.

EquBot's AI Powered International Equity ETF, which relied on IBM's Watson, was liquidated after four years. The US-version (AIEQ) is still running, but is trailing the S&P 500 Index.

Some of the surviving AI funds can be found in the accompanying table. For simplicity and because most of the ETFs are investing in the US, we measure their performance against S&P500. Except for QRAFT AI-Enhanced US Large Cap ETF (QRFT) which outperformed the S&P 500 marginally, the rest underperformed significantly.

Fund Name	Date of inception	Cumulative total return since inception (%)	Annualized return since inception	Annualized total return of S&P500 during the same period (%)	Out/(under) performance (%)
QRAFT AI-Enhanced US Large Cap ETF	5/21/2019	66.77	13.52	11.93	1.59
AI Powered Equity ETF	10/18/2017	32.48	5.13	11.06	-5.93
MerlynAI Bull-Rider Bear-Fighter ETF	10/17/2019	15.65	4.1	11.44	-7.34
Acatis AI US Equities	05/15/2018	5.44	1.06	10.89	-9.83
MerlynAI SectorSurfer Momentum ETF	12/29/2020	-17.03	-7.43	6.46	-13.89
VanEck Social Sentiment ETF	3/2/2021	-34.18	-17.03	6.38	-23.41
Source: Bloomberg (as at May 31, 2023)					

Why investing is different

Unlike teaching the computer to recognise images of dogs, where the main characteristics are distinct and unchanging, like four-legged, furry, etc., markets are "noisy". We can never tell how the market is going to perform tomorrow, or a week later and what is going to drive that performance. Most times, prices are driven by unanticipated news. Because markets are noisy, AI can pick up false signals.

The infinite monkey theorem states that a monkey hitting keys at random on a typewriter keyboard for an infinite amount of time will almost surely type any given text, including the complete works of William Shakespeare. So, feed in an infinite amount of data, and the system would invariably find one set or a combination that "explained" the outcome. The set of data, however, may or may not be the explanation for the outcome.

In image recognition, a famous story concerns a model created to distinguish between wolves and huskies. Researchers noticed the model was making obvious classification errors. They later realised that because all the wolf images used to train the model contained a snowy background, the model learned to identify wolves by looking for snow.

Furthermore, markets are complex and adaptive. There are many participants and prices reflect the collective actions of all the participants. If some traders have information that reliably predicts a future rise in price, they will start trading, pushing up the prices. Similarly, any new signal identified by a researcher, or an AI system will also be corrected as more researchers or systems identified the same signal, causing the signal to become void.

As Mr Goertzel himself noted: "If everyone is using something, its predictions will be priced into the market. You have to be doing something weird."

How to stay ahead in the investing game

So what is the weird thing that you can do to make sure you win or at least don't lose in the investing game?

In his study *Alpha and the Paradox of Skill*," Michael Mauboussin – one of Wall Street's most creative and influential minds – shared the story of Jim Rutt, former CEO of Network Solutions and chairman of the board at the Santa Fe Institute. Rutt enjoyed poker and believed that improving his poker skills was the key to making more money in poker. However, his uncle advised him: "Jim, I wouldn't spend my time getting better. I'd spend my time finding weak games."

The same applies to investing. ML is a highly competitive game, investors need not be forced to play it. Instead, they can focus on playing easier games with weaker players.

Where do you find weaker players? Generally, they are in developing and less efficient markets. In addition, one can exploit the weaknesses exhibited by most investors. Most investors are impatient, want quick profits or want to see results fast. Most investors chase after the hottest trends and feel safe going along with the crowd.

For example, AIEQ had a 1,708 per cent portfolio turnover, while QRFT had a turnover of 180 per cent for FY2022. This implied average holding periods of only 21 and 202 days, respectively. While high turnover may suit their strategies, legendary investor Warren Buffett famously remarked that "the stock market is a device for transferring money from the impatient to the patient".

By having a longer investment horizon, being disciplined, accepting that volatility is a feature of the markets, taking a diversified approach, having the courage to make calculated contrarian bets, and having the willingness to focus on areas overlooked by big institutional players (e.g. small capitalisation stocks), one may gain an edge.

As a certain avid mahjong player once said, "Play with equally matched players for a skilful and interesting game. Play with terrible players if your goal is to make money."

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